REMARKS

This application has been reviewed in light of the Office Action dated October 19, 2004. Claims 1-33 are presented for examination, and have been amended to define still more clearly what Applicant regards as his invention. Claims 1, 7, 9, 12, 18, 20, 23, 29, and 31 are in independent form. Favorable reconsideration is requested.

Applicant has amended the claims and specification to refer to a "Directed Acyclic Graph" instead of a "Directed Adjacency Graph". The term has been amended in the claims and as indicated on pages 11 and 40 of the specification. However, Applicant submits that no new matter has been added by these amendments. The specification on page 40, lines 16-17, indicates that "the principles of the Module 500 may be generalized to DAGs". As filed, the specification states that the acronym DAG refers to a directed adjacency graph. However, to one skilled in the art, the acronym DAG may designate either a directed acyclic graph or a directed adjacency graph. The Dictionary of Algorithms and Data Structures published by The National Institute of Standards and Technology and cited in the Office Action dated 19 October 2004 states that a directed acyclic graph is also known as a DAG.

Applicant further submits that the description on page 40, from line 17 on clearly relates to "Acyclic" DAGs. There is no reference to adjacency. Instead, the specification describes how the method can be generalized to handle a generalized expression tree structure in which a node can have multiple parents. An "expression tree" in computer graphics is by definition directed. Pixel data is passed up the tree from leaves to root (see, for example, page 29, lines 4-5, of the specification). One skilled in the art

would clearly understand that such a structure is a Directed Acyclic Graph, not a Directed Adjacency Graph.

The Office Action states that a substitute specification covering the claims is required pursuant to 37 C.F.R. § 1.125(a), because the terms used omit essential subject matter and use terminology not conventionally accepted in the art.

Applicant notes, however, that no section of 37 C.F.R. § 1.125(a) relates to any requirement regarding essential subject matter or conventionally used terminology, and the Office Action has not cited proper authority in this regard. Moreover, because the Office Action has not provided any specifics regarding which terms are at issue, Applicant requests that the Examiner provide a complete explanation of this requirement, and in particular, which terms used omit essential subject matter and use terminology not conventionally accepted in the art.

Claims 1-22 were rejected under 35 U.S.C. § 101 as being directed to non-statutory matter.

The Examiner appears to take the position that because the claims are not limited to execution on or by a computer, the claims are directed to a mathematical algorithm. Reference is made to M.P.E.P. § 2111 [R-1].

Applicant notes that M.P.E.P. § 2111 [R-1] discusses *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969) in which the Court discusses a rejection under 35 U.S.C. § 102, anticipation, and not under 35 U.S.C. § 101.

Further, even if the claims are directed to a mathematical algorithm, which Applicant believes they are not, the U.S. Court of Appeals for the Federal Circuit has stated that an algorithm is patentable if it is applied in a useful manner. An *unpatentable*

mathematical algorithm, in contrast, is merely an abstract idea which constitutes disembodied concepts of truths that are not "useful" in a practical way. The essential characteristic of statutory subject matter is its practical utility. Subject matter is statutory even if its useful result is expressed only in numbers (e.g., boolean values) (see, e.g., *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998); see also *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352 (Fed. Cir. 1999)). The decision in *State Street Bank Trust Co. v. Signature Financial Group Inc.*, 149 F.3d 1368, 1373, 47 USPQ2d 1596, at 1601-02 states that the claimed invention must produce a "useful, concrete and tangible result". Consequently, examination should not begin by determining if a claims recites a "mathematical algorithm". Rather, the the complete specification should be reviewed, including the detailed description of the invention, any specific embodiments, the claims, and any specific, substantial and credible utilities that have been asserted to determine whether the invention possesses a certain level of "real world" value. M.P.E.P. § 2106.

Applicant submits that Claims 1-22 are directed to statutory subject matter, namely a method and/or apparatus of generating instructions for a directed acyclic graph. In particular, independent Claim 1 relates to a method of generating instructions for a directed acyclic graph where leaf nodes represent graphic objects. The method steps refer explicitly to groups of pixel locations and to generating instructions for those graphic objects which are active at groups of pixel locations. Independent Claim 9 explicitly recites the step of executing the generated instructions so as to render an image. Applicant submits that the claimed invention relates to the "real world" problem of rendering

graphical objects. Accordingly, Applicant respectfully requests withdrawal of the rejection under Section 101.

Claims 1-6, 12-17, and 23-28 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

The claims have been carefully reviewed and amended as deemed necessary to ensure that they conform fully to the requirements of Section 112, second paragraph, with special attention to the points raised in paragraph 8 of the Office Action. Specifically, as discussed previously, Applicant has amended the claims and specification to refer to a "directed acyclic graph". Since an "expression tree" is by definition directed, there is no inconsistency with a generalization of the method to a directed acyclic graph, as claimed. It is believed that the rejection under Section 112, second paragraph, has been obviated, and its withdrawal is therefore respectfully requested.

Claims 7-11, 18-22, and 29-33 were rejected under 35 U.S.C. § 102(b) as being anticipated by Australian Patent No. AU 9947508 A (*Fraser et al.*); Claims 7, 8, 18, 19, 29, and 30 were rejected under Section 102(b) as being anticipated by U.S. Patent No. 5, 745,121 (*Politis*); Claims 7, 8, 18, and 19 have also been rejected under Section 102(b) as being anticipated by a mental process and pencil and paper; and Claims 1-6, 12-17, and 23-28 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Politis* in view of U.S. Patent No. 5,970,496 (*Katzenberger*).

As shown above, Applicant has amended independent Claims 1, 7, 9, 12, 18, 20, 23, 29, and 31 in terms that more clearly define what he regards as his invention. Applicant submits that these amended independent claims, together with the remaining

claims dependent thereon, are patentably distinct from the cited prior art for at least the following reasons.

The rejection of independent Claims 7, 9, 18, 20, 29 and 31 as being anticipated by *Fraser et al.* will be discussed first.

The aspect of the present invention set forth in Claim 7 is a method of generating instructions for an expression tree. The expression tree has a plurality of nodes comprising one or more binary nodes and a plurality of leaf nodes, where each binary node has a left branch to a descendent node and a right branch to another descendent node and represents a binary operation on the two descendant nodes. Each node represents a graphic object having object edges, with one or more of the graphic objects overlapping. The overlapping graphic objects comprise a left node region, a common region and a right node region. The method includes determining groups of one or more pixel locations, where the groups are bounded by the object edges, determining, for each group, whether the left and right branches of the one or more binary nodes are active or inactive, and traversing, for each group, the expression tree, where the left branch of any previously traversed binary node is ignored unless the right and left branches of the previously traversed binary node are active or if a left node region is required for the binary operation of the previously traversed binary node and the left branch is active and the right branch is inactive of the previously traversed binary node, and wherein a right branch of any previously traversed binary node is ignored unless the right and left branches of the previously traversed binary node are active or if a right node region is required for the binary operation of the previously traversed binary node and the right branch is active and the left branch is inactive of the previously traversed binary node. The method also includes generating, for

each group, operator instructions for any traversed binary node having active right and left branches, and leaf value instructions for any traversed leaf node.

Among other notable features of Claim 7 is traversing, for each group, the expression tree, where the left branch of any previously traversed binary node is ignored unless the right and left branches of the previously traversed binary node are active or if a left node region is required for the binary operation of the previously traversed binary node and the left branch is active and the right branch is inactive of the previously traversed binary node, and wherein a right branch of any previously traversed binary node is ignored unless the right and left branches of the previously traversed binary node are active or if a right node region is required for the binary operation of the previously traversed binary node and the right branch is active and the left branch is inactive of the previously traversed binary node.

Fraser et al. relates to methods for rendering at least one graphic object described by at least one edge into a raster pixel image. For each scan line, coordinates of intersection of those edges of the objects that intersect the scan line are determined in a predetermined order. For each adjacent pair of edge intersections, information associated with the corresponding object is examined to determine a set of active objects for a span of pixel locations between the corresponding pair of edge intersections. For each span of pixel locations, the corresponding set of active objects is used to determine a value for each of the locations within the span. A compositing model accommodating opacity is also disclosed, as are stack operations used to facilitate rendering and other features which contribute to fast processing of image components.

Applicant has found nothing in *Fraser et al.* that would teach or suggest the traversing step of Claim 7, which specifies that the left and right branches to descendent nodes of a previously traversed node are ignored, unless specified conditions are met. In contrast, the *Fraser et al.* methods evaluate the entire expression tree (see, for example page 49 lines 25 - 28).

Further, the activity table 800 of *Fraser et al.* includes three actions 804 which relate to cases 1-3 as described on page 45 of *Fraser et al.*. Thus, for each level in the activity table, it is necessary to define an action for each of the three cases, even where this action is the *NULL* operation.

In contrast, the traversing step of Claim 7 only progresses down a branch when necessary, as determined by the conditions defined in Claim 7. In practice, the method of Claim 7 results in a simpler instruction list. The methods described in *Fraser et al.*, on the other hand, involve sending a whole stream of edge messages down the pipeline 20, whereas the method step of Claim 7 merely requires the setting of a flag.

Nothing has been found in *Fraser et al.* that would teach or suggest traversing, for each group, the expression tree, where the left branch of any previously traversed binary node is ignored unless the right and left branches of the previously traversed binary node are active or if a left node region is required for the binary operation of the previously traversed binary node and the left branch is active and the right branch is inactive of the previously traversed binary node, and wherein a right branch of any previously traversed binary node is ignored unless the right and left branches of the previously traversed binary node are active or if a right node region is required for the

binary operation of the previously traversed binary node and the right branch is active and the left branch is inactive of the previously traversed binary node, as recited in Claim 7.

For at least the above reasons, Applicant submits that Claim 7 is clearly patentable over *Fraser et al.*

Independent Claims 18, and 29 are apparatus and computer readable medium claims respectively corresponding to method Claim 7, and are believed to be patentable over *Fraser et al.* for at least the same reasons as discussed above in connection with Claim 1. Additionally, independent Claims 9, 20, and 31 include features similar to those discussed above in connection with Claim 7. Accordingly, Claims 9, 20, and 21 are believed to be patentable over *Fraser et al.* for reasons substantially similar as discussed above in connection with Claim 7.

The rejection of independent Claims 7, 18, and 29 as being anticipated by *Politis* will now be discussed.

Politis relates a system, method and language for compositing or creating images. As described, for example from column 12, line 39, through column 15, line 29, in *Politis* a method of bounding boxes is used to reduce the number of pixels involved in each compositing operation. A process of bounding box minimization is further designed to find the smallest area portion of each graphical element that is needed to make up the final image.

For leaf nodes, *Politis* determines the bounding box of the graphical element and, for internal nodes, the bounding boxes of the left and right subtree are combined in a manner dependent on the compositing operation of the current nodes. *Politis* thus considers pixel ranges that are delimited by bounding boxes.

In contrast, the method of Claim 7 considers object edges. The method determines groups of one or more pixel locations, where the groups are bounded by object edges. The method of Claim 7 generates instructions for the expression tree within such groups of pixel locations bounded by object edges. This is different from the bounding box method of *Politis*.

In *Politis* the optimization spans the whole tree prior to rendering. In the method of Claim 7, the state of the expression tree is maintained during rendering, and changes to the state of the tree are maintained on a per-edge basis. Changes are only tracked as far as they change the state of the nodes, prior to generating instructions. Thus changes to the tree can be calculated "on the fly", rather than calculating tree states for each bounding-box defined region ahead of render.

For at least the above reasons, Applicant submits that Claim 7 is clearly patentable over *Politis*.

Independent Claims 18 and 29 are method and computer readable medium claims respectively corresponding to method Claim 1, and are believed to be patentable over *Politis* for at least the same reasons as discussed above in connection with Claim 7.

The rejection of Claims 7, 8, 18, and 19 as being anticipated by a mental process and paper and pencil will now be discussed.

The Office Action asserts that the claims cover the drawing of graphical trees for educational and instructional purposes. Applicant submits that this rejection is merely speculative and the Office Action provides no indication of how the proposed mental processes are seen to anticipate Claims 7, 8, 18, and 19. Further, nothing has been found in the cited prior art discussed above that would provide a basis for the assertion that

the claims are anticipated by a mental process and pencil and paper. If, however, the Examiner is asserting that such a mental process is common knowledge or well-known in the art, Applicant respectfully requests the Examiner to provide support for such assertion.

For at least the above reason, Applicant respectfully requests withdrawal of the rejection of Claims 7, 8, 18, and 19 as being anticipated by a mental process and paper and pencil.

The rejection of independent Claims 1, 12, and 23 as being unpatentable over *Politis* in view of *Katzenberger* will now be discussed.

The aspect of the present invention set forth in Claim 1 is a method of generating instructions for a directed acyclic graph. The directed acyclic graph comprises one or more parent nodes and one or more leaf nodes, each parent node representing an operator and having branches to respective descendent nodes, and each leaf node representing a graphic object having object edges. The method includes determining groups of one or more pixel locations, where the groups are bounded by object edges, and determining, for each group, a portion of the directed acyclic graph in accordance with activities of the operators, where the portion of the directed acyclic graph is that portion which passes data up the directed acyclic graph. The method also includes generating, for each group, instructions for the determined portion of the directed acyclic graph, where operator instructions are generated for those operators of the determined portion of the directed acyclic graph having active branches and wherein leaf node instructions are generated for those graphic objects which are active at the group of one or more pixel locations.

Among other notable features of Claim 1 are determining groups of one or more pixel locations, where the groups are bounded by object edges and generating, for each group, instructions for the determined portion of the directed acyclic graph, where operator instructions are generated for those operators of the determined portion of the directed acyclic graph having active branches and wherein leaf node instructions are generated for those graphic objects which are active at the group of one or more pixel locations.

As described above, the *Politis* methods are based on determining bounding boxes and performing bounding box minimisation. Accordingly, Applicant submits that nothing has been found in *Politis* that would teach or suggest determining groups of one or more pixel locations, where the groups are bounded by object edges and generating, for each group, instructions for the determined portion of the directed acyclic graph, where operator instructions are generated for those operators of the determined portion of the directed acyclic graph having active branches and wherein leaf node instructions are generated for those graphic objects which are active at the group of one or more pixel locations, as recited in Claim 1.

Accordingly, Applicant submits that Claim 1 is clearly patentable over *Politis*, taken alone.

Katzenberger describes a method and system for storing information in a computer system memory using a directed acyclic graph structure having related data nodes. *Katzenberger* is not seen to overcome the deficiencies of *Politis* of determining groups of one or more pixel locations, where the groups are bounded by object edges and generating, for each group, instructions for the determined portion of the directed acyclic

graph, where operator instructions are generated for those operators of the determined portion of the directed acyclic graph having active branches and wherein leaf node instructions are generated for those graphic objects which are active at the group of one or more pixel locations, as recited in Claim 1.

Therefore, even if *Politis* and *Katzenberger* were to be combined in the manner suggested by the Examiner, assuming such a combination would even be permissible, the result would not meet the terms of Claim 1.

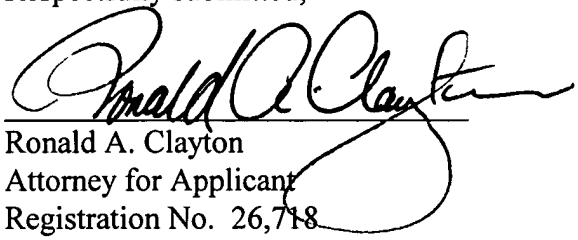
Independent Claims 12 and 23 are apparatus and computer readable medium claims respectively corresponding to method Claim 1, and are believed to be patentable over *Politis* and *Katzenberger* for at least the same reasons as discussed above in connection with Claim 1.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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